Association Between Sleep Bruxism and Psychosocial Factors in Children and Adolescents: A Systematic Review
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*CLIN PEDIATR* published online 10 November 2014
DOI: 10.1177/0009922814555976

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What is This?
Association Between Sleep Bruxism and Psychosocial Factors in Children and Adolescents: A Systematic Review

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Abstract
Objective. To summarize the association between sleep bruxism and psychosocial factors in children and adolescents. Design. Individual search strategies for five databases were developed. The references cited in the selected articles were checked and a partial gray literature search was undertaken. Only articles that used the international diagnostic criteria for sleep bruxism as proposed by the American Association of Sleep Medicine were included. Any form of reporting of psychosocial factors was considered. Results. Of the 44 retained articles, only 7 studies were finally included for the qualitative/quantitative synthesis. No evidence supportive of an association between sleep bruxism and psychosocial factors in children younger than 5 years emerged. A significant association was present in children between 6 and 11 years old and in adolescents 12 to 17 years old. Risk of bias was low-to-moderate in most of the included studies. Conclusion. The current available evidence suggests an association between sleep bruxism and psychological factors in children older than 6 years.

Keywords
sleep bruxism, review, psychosocial factors

Introduction
Bruxism is defined as the “repetitive jaw-muscle activity characterized by clenching or grinding of the teeth and/or by bracing or thrusting of the mandible.”1

Bruxism has 2 distinct circadian manifestations: It can occur during sleep (sleep bruxism [SB]) or during wakefulness (awake bruxism [AB]).2

The prevalence of SB in children (younger than 12 years) reported in a recent systematic review is highly variable (3.5% to 40.6%), with a commonly described reduction with age and without sex differences.3 Another study reported that the prevalence of bruxism in adolescents was 19%.4

As a result of periodic mechanical grinding, SB can lead to tooth wear, tooth mobility, and other clinical findings such as tongue/cheek indentation, masticatory muscle hypertrophy, temporomandibular joint pain, headaches, and masticatory muscle pain or fatigue.5

The diagnosis of bruxism is often challenging.6 Despite the stated existence of the condition, no universally accepted criteria for AB diagnosis have been reported in the literature. One of the most widely accepted criteria for the diagnosis of SB was proposed by American Academy of Sleep Medicine (AASM)7 and includes the presence of tooth grinding or clenching sounds during sleep and one or more of the following concurrent signs and symptoms: abnormal wear of the teeth, jaw muscle discomfort, fatigue, or pain and jaw lock on awakening or masseter muscle hypertrophy on voluntary forceful clenching.7

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A systematic review of psychological factors and their association with SB in adults provided a description of some temperamental traits that characterize bruxers (eg, aggressiveness, hostility, perfectionism, and stress sensitivity), and have also pointed out a high prevalence of psychosocial disorders in these individuals.

However, we are unaware of any systematic analysis of published studies that addressed SB in children and adolescents, even though several published studies have suggested a possible association between psychosocial factors and bruxism in both children and adolescents. Therefore, the objective of this systematic review is to evaluate whether SB is associated with psychosocial factors in children and adolescents.

**Methods**

This systematic review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Checklist.

**Protocol Registration**

No registration of the systematic review protocol was completed. No systematic review protocol was available.

**Study Design**

A systematic review of human studies that evaluated the association between SB and psychosocial factors in children and adolescents was undertaken.

**Eligibility Criteria**

Retained articles were only those that evaluated the association between SB and psychosocial factors. SB had to be determined by satisfying the international diagnostic criteria as proposed by the AASM.

In this review, “psychosocial factors” was used as an umbrella term to group together all psychological (eg, stress, anxiety and mood disturbances, temperamental traits, and emotions) and social or environmental agents (school satisfaction, cultural and economic conditions, social behaviors, and expectations) that may have an effect on an individual’s health.

The evaluated population was of individuals younger than 18 years. Studies from any language or peer-reviewed source were considered. Reviews, letters, and personal opinions were not included.

**Information Sources**

Detailed individual search strategies for each of the following bibliographic databases were developed: Cochrane, EMBASE, MEDLINE, PubMed, and Virtual Health Library (BVS -Database that include articles in Spanish and Portuguese from MEDLINE, LILACS, Wholis, BBO and AdoLec.). The references cited in the finally selected articles were also checked for any references missed in the electronic database searches. A partial gray literature search was taken using Google Scholar. This search was limited to the first 100 most relevant articles published in the past 5 years.

**Search**

Appropriate truncation and word combinations were selected and adapted for each database search (Appendix A, available online at http://cpj.sagepub.com/content/by/supplemental-data). All references were managed by reference manager software (RefWorks–COS-ProQuest, LLC. © 7200 Wisconsin Avenue, Suite 601 Bethesda, MD 20866, USA) and duplicate hits were removed. End search date was June 6, 2014 across all databases.

**Study Selection**

The selection was completed in 1 phases. In phase 1, 2 reviewers independently reviewed the titles and abstracts of all identified electronic database citations. Any studies that clearly did not fulfill the inclusion criteria were discarded. In phase 2, the same selection criteria were applied to the remaining full articles to confirm their eligibility. The same 2 reviewers independently participated in phase 2. Any disagreement in either phase was resolved by discussion and mutual agreement between the 2 reviewers. A third author was involved, when required, to make a final decision.

**Data Collection Process**

Two authors independently collected key information from the selected articles, after which cross checking procedures ascertained the completeness of the retrieved information. Any disagreement was resolved again by discussion and mutual agreement between the authors. A third author was involved, when required, to make a final decision.

**Data Items**

For the included studies, the following information was recorded: author, year of publication, sample size, demographic features of the sample, objectives, data collection instruments (eg, psychological tests), results, and conclusions pertaining to the association between SB and psychosocial factors. If the required data were
Risk of Bias in Individual Studies

We evaluated the methodology of selected studies by using the quality in prognosis studies tool (QUIPS). Two reviewers categorized each 6 bias domains (study participation, study attrition, prognostic factors measurement, outcome measurement, study confounding, statistical analysis, and reporting) in high, moderate or low risk of bias. Any disagreement was resolved by discussion until a mutual agreement between the 2 authors was attained. A third author became involved when required to make a final decision.

Outcome Measures

The presence of psychosocial factors in both groups of subjects, with and without bruxism was analyzed. Any type of related measurement was considered (categorical variables, continuous variables—mean difference, odds ratio, and relative risk).

Synthesis of Results

If the data from different studies were considered homogeneous enough to properly justify a meta-analysis, this step was planned a priori.

Risk of Bias Across Studies

We assessed the clinical heterogeneity (by comparing variability among the participant’s characteristics and outcomes studied), methodological heterogeneity (by comparing the variability in study design and risk of bias), and statistical heterogeneity.

Results

Study Selection

In the initial search (phase 1), 912 citations were identified across the 5 electronic databases plus 100 citations from Google Scholar. After duplicates were removed, 638 different citations were considered. Then, in a comprehensive evaluation of the abstracts, 594 were excluded. Therefore, only 44 articles were consequently selected for phase 2 assessment. No additional study that might have been inadvertently missed by the search procedures was identified from reviewing the reference list of these 44 studies. From these remaining studies, 37 were later excluded (Appendix B, available online at http://cpj.sagepub.com/content/by/supplemental-data), including one because of the inaccessibility of the full text. Thus, only 7 studies remained for the final qualitative/quantitative synthesis. A flowchart of the process of identification, inclusion, and exclusion of studies is shown in Figure 1.

Study Characteristics

Two articles were published in a sleep medicine journal while the remaining 5 in dental journals. Sample size ranged from 20 individuals to 167 individuals. The selected studies were conducted in 5 different countries: Brazil, Colombia, Greece, Iran, and the United States. All were published in English. A summary of the study descriptive characteristics can be found in Table 1.

Risk of Bias Within Studies

The reported methodological quality of the included studies was ranged between low and high, depending of the domains included in such studies (Table 2).

Synthesis of Results

As the data from the included studies were clearly and significantly heterogeneous, a meta-analysis was not justified. Therefore, only a qualitative synthesis could be performed.

One study conducted in 5- to 6-year-old children found that children with and without SB did not differ significantly with respect to their personality traits. However, 3 studies examined children between ages of 6 and 8, 7 and 11, and 8 and 11 years, respectively, and identified a significant association between bruxism and psychosocial disorders. Vanderas et al showed that epinephrine and dopamine had a significant association with bruxism (relative risk ratio of 9.69 (95% confidence interval [CI] = 1.04-45.27), and of 2.89 (95% CI = 1.04-7.80) or 15.38 (95% CI = 1.68-67.17), respectively, depending, of the catecholamine levels. According to the authors, the relative risk of developing bruxism increased with higher epinephrine and dopamine levels. This dose–response trend considerably strengthened the positive relationship between emotionally stressful states and bruxism. Ferreira-Bacci et al found that around 83% of their SB sample needed psychological or psychiatric interventions, and that approximately 20% presented evidence of significant physical and psychological manifestations of stress. Restrepo et al reported a significant difference between control and bruxism groups regarding tense personality
Figure 1. Flow diagram of literature search and selection criteria.⁴

Adapted from PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses).

(P = .024) and anxiety (P = .007), whereby the SB group had increased values.

In a study that specifically targeted adolescents (12-14 years old), Katayoun et al.²³ reported higher prevalence of psychosocial disorders in subjects with SB, particularly in the areas of thought disorders (P < .005), conduct disorders (P < .050), and antisocial disorders (P < .060). The result of odds ratio revealed that an adolescent with SB had a 16-fold increased probability for psychosocial disorders than comparable adolescent without SB.
<table>
<thead>
<tr>
<th>Author, Year</th>
<th>Sample/Setting</th>
<th>Case-Control Study</th>
<th>Age (Years)</th>
<th>Objectives</th>
<th>Instrument</th>
<th>Psychosocial Factors</th>
<th>Statistical Analysis</th>
<th>Findings</th>
<th>Main Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kuch et al., 1979</td>
<td>SB group: 50 (25 boys/25 girls) Control group: 50 (25 boys/25 girls) Rosemount School District, Minneapolis, USA</td>
<td>Yes</td>
<td>5-6</td>
<td>To determine if correlation between bruxism and personality characteristics</td>
<td>Missouri Children’s Picture Series</td>
<td>Conformity, masculinity/femininity, maturity, aggression, inhibition, activity levels, sleep disturbance, somatization</td>
<td>Analysis of variance Student’s t test (2-tailed)</td>
<td>None of the test group means scores differed significantly from the control group mean scores (P &gt; .05)</td>
<td>Bruxism at age 5 or 6 appears to have little psychological significance</td>
</tr>
<tr>
<td>Vandas et al., 1999</td>
<td>SB group: 129 (74 boys/55 girls) Control group: 38 (17 boys/21 girls) Public schools, Greece</td>
<td>No</td>
<td>6-8</td>
<td>To investigate the association between urinary catecholamines as biomarkers of stress and the presence of bruxism</td>
<td>Urinary test of catecholamines (epinephrine, norepinephrine, dopamine)</td>
<td>Stress</td>
<td>Logistic multiple regression analysis</td>
<td>Bruxer children had a higher mean epinephrine, norepinephrine, and dopamine. The relative risk between 1 and 9.69, and 1 to 15.38, respectively, depending on the catecholamine levels, in a 95% CI. Epinephrine (P = .03) and dopamine (P = .01) had a significant association with bruxism</td>
<td>Emotional stress is a prominent factor in the development of bruxing behavior</td>
</tr>
<tr>
<td>Herrera et al., 2006</td>
<td>SB group: 10 (5 boys/5 girls) referred to the sleep or dental clinic for complaints of grinding sounds during sleep and abnormal tooth wear Control group: 10 (5 boys/5 girls) nonbruxers USA</td>
<td>Yes</td>
<td>5-15 (9.2)</td>
<td>To assess the daytime behavior and cognitive impact of bruxism</td>
<td>Kaufman Brief Intelligence Test (K-BIT) Achenbach Child Behavior Checklist (CBCL)</td>
<td>Daytime cognitive behavioral</td>
<td>Student’s t test (2-tailed) Two-tailed Pearson correlations</td>
<td>The K-BIT score correlated strongly with the internalizing problems (r = 0.76, P = .047, analysis of variance), and externalizing problems scale (r = 0.74, P = .06, analysis of variance). The most significant of the individual subscales were the somatic problems scale (r = 0.85, P = .01, analysis of variance) and conduct problems (r = 0.760, P = .04, analysis of variance)</td>
<td>Suggested that bruxer children have a higher arousal index, which may be associated with an increase incidence of attention-behavior problems</td>
</tr>
<tr>
<td>Katayoun et al., 2008</td>
<td>SB group: 25 bruxers Control group: 25 nonbruxers Only girls who attended summer camp, Tehran, Iran</td>
<td>Yes</td>
<td>12-14</td>
<td>To determine the correlation between psychosocial disorders and bruxism</td>
<td>Youth Self Report Questionnaire (YSR)</td>
<td>Thought disorders, conduct disorders, antisocial disorders</td>
<td>Fischer exact test</td>
<td>Reported higher prevalence of thought disorders (P &lt; .005), conduct disorders (P &lt; .05) and antisocial disorders (P &lt; .060) in bruxers. The odds ratio revealed that a bruxer adolescent has 16 times greater probability for psychosocial disorders than a nonbruxer one</td>
<td>Suggested the existence of an association between bruxism and psychosocial disorders</td>
</tr>
<tr>
<td>Author, Year</td>
<td>Sample Setting</td>
<td>Case-Control Study</td>
<td>Age (Years)</td>
<td>Objectives</td>
<td>Instrument</td>
<td>Psychosocial Factors</td>
<td>Statistical Analysis</td>
<td>Findings</td>
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<tr>
<td>Restrepo et al., 2008</td>
<td>SB group: 26 Control group: 26 Montessori School, Medellin, Colombia</td>
<td>Yes 8-11 (9.45)</td>
<td>To describe the personality traits and the anxiety level of bruxer children</td>
<td>Children’s Personality Questionnaire (CPQ) Conners’s Parents Rating Scales (CPRS)</td>
<td>Anxiety level, personality traits (outgoing-reserved, intelligent-dull, ego strength-weakness, excitable-placid, dominant-submissive, happy-go-lucky-serious, conscientious-frivolous, venturesome-shy, sensitive-tough, restrained-rigorous, shrewd-artless, apprehensive-self-assured, self-controlled-lax, tense-relaxed, low-anxiety-high anxiety, introversion-extraversion, tough-mindedness)</td>
<td>Student’s t test</td>
<td>Statistically significant difference between the control and bruxism group regarding tense personality ($P = .024$ and anxiety ($P = .0007$)</td>
<td>There is a possible etiological relationship between tense and high personality trait and bruxism</td>
<td></td>
</tr>
<tr>
<td>Ferreira-Bacci et al., 2012</td>
<td>SB group: 29 (18 boys/11 girls) seeking routine dental care and with episodes of tooth grinding/clenching</td>
<td>No 7-11 (8.8)</td>
<td>To evaluate the behavioral profile of a group of bruxer children</td>
<td>Rutter’s Child Behavior Scale-A2 (Brazilian version) Child Stress Scale</td>
<td>Stress</td>
<td>Descriptive statistics</td>
<td>82.76% of the sample needed psychological or psychiatric intervention and 18.75% presented significant physical and psychological manifestations of stress</td>
<td>Behavioral problems and potential emotional problems can be risk factors to bruxism in children</td>
<td></td>
</tr>
<tr>
<td>Türkoglu et al., 2013</td>
<td>SB group: 35 (18 boys/17 girls) consecutively referred to 2 different hospitals, Turkey Control Group: 35 (18 boys/17 girls) who were seen in an outpatient dental clinic for a routine oral inspection, not on basis of any specific dental complaint, Turkey</td>
<td>Yes 8-17</td>
<td>To examine state-trait anxiety, anxiety sensitivity, depressive symptoms levels, and psychiatric disorders in children and adolescents with SB</td>
<td>Childhood Anxiety Sensitivity Index State-Trait Anxiety Inventory for Children Children Depression Inventory</td>
<td>State-trait anxiety, anxiety sensitivity, depressive symptom levels, and psychiatric disorders</td>
<td>Mann-Whitney U test, Fisher’s analysis, Multivariate logistic regression analysis</td>
<td>At least 1 psychiatric disorder was present in 42.9% of the patient group and 17.1% of the control group ($P &lt; .05$). Trait state anxiety, anxiety sensitivity, and the severity of depression symptoms were also higher in the SB group ($P &lt; .05$). After the multivariate analysis, the associations between state and trait anxiety, depression, and SB became statistically insignificant, while the association with anxiety sensitivity persisted</td>
<td>Suggested that SB is related to anxiety sensitivity</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: SB, sleep bruxism; CI, confidence interval.

*The references of validation of the instruments are available in Appendix D, available online at http://cpj.sagepub.com/content/by/supplemental-data.
Table 2. QUIPS Risk of Bias Assessment Instrument for Prognostic Factor Studies.a

<table>
<thead>
<tr>
<th>Biases (Summary)</th>
<th>Issues to Consider for Judging Overall Rating of “Risk of Bias”</th>
<th>Ferreira-Bacci et al23</th>
<th>Herrera et al21</th>
<th>Katayoun et al23</th>
<th>Kuch et al22</th>
<th>Restrepo et al24</th>
<th>Türkoglu et al17</th>
<th>Vanders et al8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study participation</td>
<td>The study sample represents the population of interest on key characteristics, sufficient to limit potential bias of the observed relationship between PF and outcome</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>Study attrition</td>
<td>Loss to follow-up (from baseline sample to study population analyzed) is not associated with key characteristics (i.e., the study data adequately represent the sample) sufficient to limit potential bias to the observed relationship between PF and outcome</td>
<td>Moderate</td>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>PF measurement</td>
<td>PF is adequately measured in study participants to sufficiently limit potential bias</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Outcome measurement</td>
<td>Outcome of interest is adequately measured in study participants to sufficiently limit potential bias</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Study confounding</td>
<td>Important potential confounders are appropriately accounted for, limiting potential bias with respect to the relationship between PF and outcome</td>
<td>Low</td>
<td>Low</td>
<td>Moderate</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Statistical analysis and presentation</td>
<td>The statistical analysis is appropriate for the design of the study, limiting potential for presentation of invalid or spurious results</td>
<td>High</td>
<td>High</td>
<td>Moderate</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

Abbreviations: QUIPS, quality in prognosis studies tool; PF, prognostic factor.

aRatings: High, moderate, and low indicate high, moderate, and low risk of bias, respectively.

Türkoglu et al17 analyzed children and adolescents between 8 and 17 years old and found that state anxiety, anxiety sensitivity, and the severity of depression symptoms were higher in the SB group (P<.05). Finally, one study21 conducted in 5- to 15-year-old children suggested that SB could be associated with attention-behavior problems, based on the higher number of arousals detected in SB (66% of the cases). In this study, arousals from sleep were associated with parental reports of somatic or physical complaints and externalizing and internalizing behaviors, as well as with attention problems in this small group of children. Although there was a trend, the statistical significance for these correlations (P = 0.07-0.1) was not achieved.

Discussion

Summary of Evidence

In this systematic review, we investigated the potential associations between SB and psychosocial factors in children and adolescents. The role of psychosocial factors in the etiology of bruxism is probably one of the most debated issues concerning this disorder, with stress being clearly considered as a significant trigger.2 This assumption is reliant on reports by adult patients who usually describe increases in their nighttime teeth grinding during stressful life periods. In addition, a large proportion of clinicians, will often attribute a patient’s bruxing behavior to underlying increased stress.2 Although the first study supporting this argument for children26 dates back more than 40 years ago, definitive conclusions are yet to be confirmed.

Several methodological inadequacies may have contributed significantly to the current lack of clarity. Many of the studies that have reported a possible association between pediatric SB and psychosocial factors9-16 did not use a homogeneous set of diagnostic criteria for both psychosocial factors and SB. Furthermore, the most striking limitations of these studies are represented by the subjectivity of the self-reported diagnosis of bruxism, and by the lack of information on whether the studies address sleep or awake bruxism. Standardized definition and a diagnostic grading system are prerequisites for
evidence-based practice management.\(^1\) SB diagnosis based on overnight polysomnographic recordings is very well documented and accepted by most clinicians and researchers as the gold standard.\(^{27}\) Unfortunately, overnight polysomnographic sleep studies are onerous, labor-intensive, impose substantial discomfort on the children and their families, and are relatively inaccessible to children.\(^{28}\) In our study, because of the lack of a consensus in the literature regarding a definitive tool to SB diagnosis, the one proposed by the AASM was used.\(^7\)

In fact, we selected only articles that met this classification criterion regardless of whether the authors actually mentioned the use of this classification system. In the second phase of the selection process, 23 articles were excluded because they failed to meet the AASM diagnostic criteria.\(^7\) Furthermore, the instruments employed to measure psychological factors associated with SB examined a broad range of psychological traits and constructs, although not all of them have been validated for use with children (Appendix C, available online at http://cpj.sagepub.com/content/by/supplemental-data). Of note, many of the psychological measures chosen used tests with outdated normative data, tested populations for which the normative data were potentially invalid, and/or had questionable psychometric properties. Kuch et al\(^{22}\) used a measure that targets aggression and hyperactivity with weak psychometric properties. We would therefore be hesitant to draw any firm conclusions based on the findings of this particular study. We decided against excluding this study,\(^{22}\) but rather outlined the limitations of the instrument used. Most of the other selected studies generally used improved psychological instruments. However, the Rutter Scale used by Ferreira-Bacci et al\(^{25}\) is also problematic as far as its validity, even if a Brazilian version of the test was employed. The questionnaire used by Restrepo et al\(^{24}\) was also an outdated test, and appears to have been used in a culturally inappropriate setting, which could weaken the validity of the conclusions from the study. However, the authors\(^{24}\) also included the Conners’ scale, an approach that appears to reinforce their findings. Considering that there exist a large body of literature on the gold standard measures of stress, anxiety, and other psychological factors in children and adolescents,\(^{29}\) there is no doubt that such considerations need to be incorporated when researchers select the measures that will be used to evaluate the target population during the research planning and design phase.

We identified 7 articles that met our inclusion criteria. Only 1 of the 7 selected studies\(^{22}\) reported on the absence of an association between SB and psychosocial variables (conformity, masculinity/femininity, maturity, aggression, inhibition, activity levels, sleep disturbance, and somatization). This study was conducted in younger children ranging between 5 and 6 years of age. Thus, the younger characteristics of their cohort might have influenced the results. Furthermore, the psychological measure used may have also hampered the conclusions, given the questionable psychometric properties of the instrument selected and employed for this study. The authors\(^{22}\) concluded that although bruxism in children aged 5 to 6 years may be a relatively common childhood habit, no psychosocial associations are obviously present. These findings agree with those of Rodriguez et al\(^{20}\) who did not find an association between dental wear and emotional state in 5-year-old children. However, this study did not meet our review inclusion criteria.

In contrast, 3 of the selected studies\(^{8,24,25}\) reported an association between SB and psychosocial factors in children between 6 and 11 years old, especially between SB and stress, anxiety and tension personality traits. Two of these studies\(^{24,25}\) used 2 different questionnaires, one for children and another for parents, which likely added increased reliability to its findings. The convergent validity that can be gained from measuring both of these participant groups undoubtedly strengthens the conclusions. The other study\(^{8}\) used urinary tests to assess catecholamine levels as a measure of underlying stress, since the main objective of the investigators was to test the hypothesis that emotionally stressful states as measured by urinary catecholamines may affect the development of bruxism. Others studies in the same age group that had to be excluded from the final analyses\(^{10,12,13}\) also reported a positive association between SB and anxiety/stress. These latter studies, however, did not meet our inclusion criteria, because they failed to consistently use the AASM diagnostic tool.\(^7\)

Using a case–control approach, Katayoun et al\(^{23}\) reported a significant association between SB and psychosocial disorders (thought, conduct, and antisocial disorders) among 12- to 14-year-old adolescents. Similarly, Türkoğlu et al\(^{17}\) conducted a study in patients aged 8 to 17 years and reported that SB is associated with anxiety sensitivity. These results agree with those of Lindqvist\(^{26}\) who reported a positive association between atypical facets and nervous disorders in 12-year-old children.

Finally, one study\(^{21}\) surveying small pediatric cohort (5- to 15-year-old children and adolescents; n = 10 for SB and no SB groups) evaluated the association of SB with attention-behaviour problems, and explored the potential contribution of arousals in sleep bruxers. Although arousals were correlated with attention problems, bruxer children trended toward more behavior problems.

In summary, although SB is common in preschool children,\(^{15}\) we did not identify any published studies
evaluating the association between SB and psychosocial factors in younger children, that is, <5 years old. In children between 5 and 6 years old it seems that bruxism is a relatively common childhood habit that does not appear to exhibit significant psychological correlates. In older children (6-11 years old) and in adolescents (12-17 years old), the available evidence supports a positive association between SB and psychosocial factors. However, we should caution that these portrayed and a priori valid associations could reflect normal developmental processes rather than represent causal inferences. Methodologically stronger research studies in these populations are, however, warranted.

Assuming the face validity of the current systematic review, our findings can be rationalized if we consider that in most places, school begins after 5 years of age. From the developmental standpoint, children will gradually become less egocentric and, henceforth, new experiences, particularly in social settings will increase their effects. Thus, the period ranging from 7 to approximately 12 to 14 years of age will be characterized by transition from syncretism to objectivity, whereby experiences and self gradually lose their quality of being fragments of an absolute and undivided experience to become interdependently coordinated with intuition. In this context, the effects of anxiety and stress in children and adolescents are similar to the reported findings in the general population. Ultimately, SB is a dynamic behavior that concerns medical, dental, and psychological health care domains, and may be an important behavior to consider within a multidisciplinary health care context. Multidisciplinary teams should be constituted to develop research and clinical strategies to diagnose and treat SB in children and adolescents, and thus unravel in a more mechanistic fashion the emerging interdependencies between psychosocial conditions and phenotypic behaviors during sleep such as SB.

**Limitations**

Some methodological limitations of this review should be considered. First, there was no standardization regarding the survey instrument used to quantify psychological factors. Different psychological variables were considered with overlapping confusing definitions, all of which may obscure the actual findings. Also, the questionnaires were applied by different professionals, and the tools employed may very well be at the root of the inconsistent results because of psychometric and sampling issues. Additionally, 1 of the 7 articles had a very small sample and another did not include a control group.

**Conclusions**

Based on the available evidence, there is no evidence to support or dispel the presence of an association between SB and psychosocial factors in children younger than 5 years; a significant association between SB and stressful, anxious, and tense personality traits emerged in children between 6 and 11 years of age; similarly, a significant association between SB and psychosocial disorders (anxiety thought, conduct, and antisocial disorders) was present in adolescents (12-17 years old).

Considering that pediatricians are the first professional to which the parents and the children complain about bruxism, increased knowledge regarding SB in general, and the association between SB and psychosocial factors may aid in the diagnostic process, formulation of the initial treatment plan, and ultimately assist in timely referral to the appropriate specialist as needed.

**Declaration of Conflicting Interests**

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

**Funding**

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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